



Feb 98

GCMS Demonstration Plan

**DEMONSTRATION PLAN FOR THE EVALUATION OF
FIELD-TRANSPORTABLE
GAS CHROMATOGRAPHY/
MASS SPECTROSCOPY
TECHNOLOGIES**

**Environmental Technology Evaluation Program
Consortium for Site Characterization Technologies**

DTIC QUALITY INSPECTED

Sponsored by:

**U.S. Environmental Protection Agency
National Exposure Research Laboratory
Characterization Research Division**

Las Vegas, Nevada

APPROVAL SIGNATURES

DISTRIBUTION STATEMENT A

**Approved for public release;
Distribution Unlimited**

19980224 023

INTERNET DOCUMENT INFORMATION FORM

A . Report Title: Demonstration Plan for the Evaluation of Field-Transportable Gas Chromatography/Mass Spectroscopy Technologies

B. DATE Report Downloaded From the Internet 2/21 /98

C. Report's Point of Contact: (Name, Organization, Address, Office Symbol, & Ph #): U.S. Environmental Protection Agency

D. Currently Applicable Classification Level: Unclassified

E. Distribution Statement A: Approved for Public Release

F. The foregoing information was compiled and provided by:
DTIC-OCA, Initials: _____ **Preparation Date:** _____

The foregoing information should exactly correspond to the Title, Report Number, and the Date on the accompanying report document. If there are mismatches, or other questions, contact the above OCA Representative for resolution.

This document is intended to ensure that all aspects of the demonstration are documented, scientifically sound, and that operational procedures are conducted within quality assurance and quality control specifications and health and safety regulations.

The signatures of the individuals below indicate concurrence with, and agreement to operate in compliance with, procedures specified in this document.

FINAL DEMONSTRATION PLAN

Art Verardo, Sandia National Laboratories Date

Project Manager

Grace Bujewski, Sandia National Laboratories Date

Project Leader

Susan Bender, Sandia National Laboratories Date

Technical Lead

Gary Brown, Sandia National Laboratories Date

QA/QC Officer

Bob Helgesen, Sandia National Laboratories Date

Field Operations Coordinator

Field Operations Coordinator

Stephen Billets, EPA NERL-CRD-LV Date

Program Manager

Eric Koglin, EPA NERL-CRD-LV Date

Program Manager

Gary Robertson, EPA NERL-CRD-LV Date

Technical Lead

Mike Barcelona, National Center for Bioremediation Date

Research and Development, University of Michigan, Ann Arbor

Mike Lee, Wurtsmith AFB Date

Site Demonstration Safety Officer

Mark Henry, Wurtsmith AFB Date

Site Manager

Joe Rossabi, Westinghouse Savannah River Date

Site Safety Officer

APPROVAL SIGNATURES

The signatures of the developers below indicate that they have reviewed the experimental design of the demonstration plan and agree that the design will fairly represent and evaluate the developer's claims regarding performance of their technologies.

The signatures of the individuals below indicate concurrence with, and agreement to operate in compliance with procedures specified in this document.

FINAL DEMONSTRATION PLAN

Dr. Jochen Franzen Date

Bruker-Franzen Analytic

Rich Yelton Date

Teledyne Electronic Technologies

Lisa White Date

Viking Instruments Corporation

Acknowledgments

The EPA gratefully acknowledges the efforts and technical expertise of Susan Bender, SNL, and Gary Robertson, NERL CRD-LV, in drafting, planning and coordinating this document. Special thanks to Cecilia Diniz, a student at Bryn Mawr College, for editing and making significant contributions in the preparation of this document.

APPROVAL SIGNATURES i

ACKNOWLEDGMENTS iv

TABLE OF CONTENTS vii

EXECUTIVE SUMMARY 1

ABBREVIATIONS AND ACRONYMS 2

1.0 INTRODUCTION 5

1.1 Demonstration Purpose 5

1.2 Consortium Overview 6

1.3 Selecting Technologies 11

1.4 Demonstrating Technologies 12

1.5 Evaluating Technologies 12

1.6 Demonstration Sites 13

1.7 Demonstration Schedule 13

1.8 Demonstration Participants 13

2.0 DEMONSTRATION RESPONSIBILITIES AND COMMUNICATION 15

2.1 Demonstration Participants Roles 15

2.2 Responsibilities 16

2.3 Communication 18

3.0 PREDEMONSTRATION ACTIVITIES 18

3.1 Selecting Sites 19

3.2 Selecting Confirmatory Laboratory and Analytical Methods 21

3.3 Predemonstration Sampling and Analysis 23

4.0 TECHNOLOGY DESCRIPTION 25

5.0 DEMONSTRATION SITE DESCRIPTIONS 42

5.1 Site Name and Location-SRS 42

5.2 Site Name and Location-WAFB 44

5.2 Site Name and Location-WAFB 44

6.0 SAMPLING PLAN 46

6.1 Overview of Sampling Operations-SRS 46

6.2 Overview of Sampling Operations-WAFB 51

6.3 Communications, Documentation, Logistics, and Equipment 57

7.0 EXPERIMENTAL DESIGN 59

7.1 Vendor Claims 59

7.2 Objectives 61

7.3 Factors to Be Considered 61

7.4 Sampling Design 63

7.5 Statistical Analysis 63

8.0 QUALITY ASSURANCE PROJECT PLAN 64

8.1 Purpose and Scope 64

8.2 Quality Assurance Responsibilities 64

8.3 Data Quality Parameters 65

8.4 Calibration Procedures, Quality Control Checks, Corrective Action 67

8.5 Data Reduction, Validation, and Reporting 69

8.6 Calculation of Data Quality Indicators 70

8.7 Performance and System Audits 71

8.8 Quality Assurance Reports to Management 72

9.0 DATA MANAGEMENT AND ANALYSIS 72

10.0 HEALTH AND SAFETY PLAN-SRS 76

11.0 HEALTH AND SAFETY PLAN-WAFB 90

12.0 DELIVERABLES 114

12.1 Demonstration Plan 114

12.2 Technology Evaluation Report 114

12.3 Innovative Technology Evaluation Report 115

12.4 Technology Briefs 116

12.5 Other Reports 116

Appendices:

The following appendices are not provided with this Web document but are available upon request

A. Method 8260: Gas Chromatography/Mass Spectrometry for Volatile

Organics: Capillary Column Technique

B. Standard Operating Procedures for Summa Canister Analysis Using EPA

Compendium Method TO-14: "The Determination of Volatile Organic

Compounds in Ambient Air Using Summa Passivated Canister Sampling and GC/MS Analysis"

C. NCIBRD Chain-of-Custody Procedures (Figures 1-5)

D. Commerce Business Daily Notice

ELEMENTS OF A TECHNOLOGY DEMONSTRATION PLAN

EXECUTIVE SUMMARY

The purpose of this document is to provide a strategy for collecting data that can be used to fairly and thoroughly evaluate the performance of field transportable GC/MS technologies for measuring volatile organic compounds in soil, soil gas and ground water. This demonstration is being conducted under the auspices of the Consortium for Site Characterization Technology (CSCT). The planning and execution of the demonstration is a collaborative effort between the Department of Energy's Sandia National Laboratories (demonstration planning, execution, data evaluation, and report preparation), the environmental technology demonstration programs at the Savannah River Site (SRS) and Wurtsmith AFB, which help to coordinate site logistics, and the technology developers (demonstration plan preparation and review, technology operation, and data evaluation).

The primary objectives of the demonstration are: (1) to verify vendor claims regarding technology performance, (2) to determine how well each developer's technology performs in comparison to conventional laboratory analytical methods and protocols, (3) to determine the logistical and economic resources needed to operate each instrument, and (4) to produce a verified data set for use in considering the technology for future use in hazardous waste site investigations, for assessing the performance of remediation technologies, and for post-clean up monitoring.

The developers participating in this demonstration are Bruker-Franzen Analytical, Billerica,

Massachusetts, Teledyne Electronic Technologies, Mountain View, California, and Viking Instruments Corporation, Chantilly, Virginia. The demonstration will be conducted at two different sites. The first demonstration will be conducted at the Department of Energy's Savannah River Site from July 16-21, 1995. The second demonstration will be conducted at Wurtsmith Air Force Base in Oscoda, Michigan, from September 11-15, 1995. The conditions at each of these sites represent what are considered typical conditions under which the technology would be expected to operate, but it is not considered all inclusive. Both sites are contaminated with chlorinated solvents and have a wide range of levels of contamination in the media of interest.

This demonstration plan defines:

the roles and responsibilities of the demonstration participants;

the procedures governing demonstration activities such as sample collection, preparation, and analysis, and data collection and interpretation;

the experimental design;

the quality assurance/quality control (QA/QC) procedures for conducting the demonstration and for assessing the quality of the data generated; and

the health and safety requirements for performing work at the two demonstration sites.

Acronyms

ACE	Alternating Chemical/Electron Ionization
AFB	Air Force Base
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CBD	Commerce Business Daily
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
CPR	Cardio-pulmonary Resuscitation
CRD-LV	Characterization Research Division
CSCT	Consortium for Site Characterization Technology
CVOC	Chlorinated Volatile Organic Compounds
D/NETDP	Department of Defense/National Environmental Technology Demonstration Program
DC	Direct Current
DCE	Dichlorethylene
DOD	Department of Defense
DOE	Department of Energy
EI	Electron Ionization
EI/CI	Electron Ionization/Chemical Ionization

EM	Emission Mass Spectrometer
EnTICE	Environmental Technology Innovation Commercialization and Enhancement
EPA	Environmental Protection Agency
ETI	Environmental Technology Initiative
FID	Flame Ionization Detector
FNF	Filtered Noise Field
FSP	Field Sampling Plan
FY	Fiscal Year
GC/MS	Gas Chromatography/Mass Spectrometry
GEL	General Engineering Laboratories
HASP	Health and Safety Plan
HSD	Health and Safety Director
ICR	Ion-Cyclotron Resonance
ITER	Innovative Technology Evaluation Report
JP-4	Jet Fuel
LRL	Lower Recovery Limit
MI	Michigan
MIM	Multiple Ion Monitor
MIMS	Membrane Inlet Mass Spectrometry
MS/MS	Mass Spectrometry/Mass Spectrometry
MSDS	Material Safety Data Sheet
NAPL	Non-aqueous Phase Liquid
NCIBRD	National Center for Integrated Bioremediation Research and Development
NEC	National Electric Code
NERL	National Exposure Research Laboratory
NIOSH	National Institute for Occupational Safety and Health
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PAH	Polyaromatic Hydrocarbon
PC	Personal Computer
PCE	Tetrachloroethene
PE	Performance Evaluation
PFTBA	Perfluorotributylamine
PID	Photoionization Detector
PPBW	Parts Per Billion by Weight
PPE	Personal Protective Equipment
PPMW	Parts Per Million by Weight
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control

SAC	Strategic Air Command
SC	South Carolina
SHSO	Site Health and Safety Officer
SIM	Selected Ion Monitoring
SNL	Sandia National Laboratories
SOP	Standard Operating Procedure
SRI-CI	Selective Reagent Ion Chemical Ionization
SRS	Savannah River Site
SW-846 Method 8260	Gas Chromatography/Mass Spectrometry for Volatile Organics: Capillary Column Technique
TA	Traverse Analytical
TBD	To Be Determined
TCA	Trichloroethane
TCDD	Tetrachlorodibenzofuran
TCE	Trichloroethene
TER	Technology Evaluation Report
TO-14	Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Summa Passivated Canister Sampling and GC/MS Analysis
TOC	Total Organic Carbon
UM	University of Michigan
USCS	Unified Soil Classification System
UST	Underground Storage Tank
UV	Ultraviolet
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

The following appendices are not provided with this Web document but are available upon request

Appendix A

Method 8260: Gas Chromatography/Mass Spectrometry for Volatile Organics: Capillary Column Technique

Appendix B

Standard Operating Procedure Using EPA Compendium Method TO-14:

"The Determination of Volatile Organic Compounds

in Ambient Air Using Summa Passivated Canister

Sampling and GC/MS Analysis"

Appendix C
NCIBRD
Chain-of-Custody Procedures
Figures 1-5

Appendix D
Commerce Business Daily Notice

2. The verification letter is prepared by EPA and provided to the developer. It will be issued only to developers for those technologies meeting or exceeding the performance objectives identified in the demonstration plan.

 **[Go to ORD Homepage.](#)**

 **[Back to ETV Home Page.](#)**